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(71) Applicant
W. R. Grace & Co. (USA-Connecticut),
Grace Plaza, 1114 Avenue of the Americas, New York, New
York 10036, United States of America

(72) Inventor
Ronan Richard O'Neill

(74) Agent and/or Address for Service
J. A. Kemp & Co., 14 South Square, Gray's Inn,
London WC1R 5EU

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(54) Bag opening device for packaging

(57) Bag opening apparatus uses a pin 8a to penetrate both the upper and lower panels 16 and 17 respectively, of packaging bags, and then upon retraction of the pin from an anvil hole 10, the upper panel 16 is entrained by the pin while the lower panel is held down, for example by means of adhesive carrier tapes on which the bags are mounted.

Fig.2.

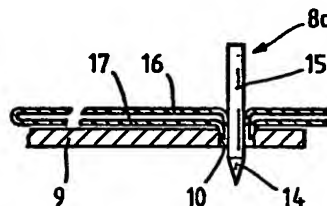
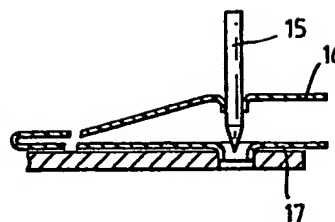


Fig.3.



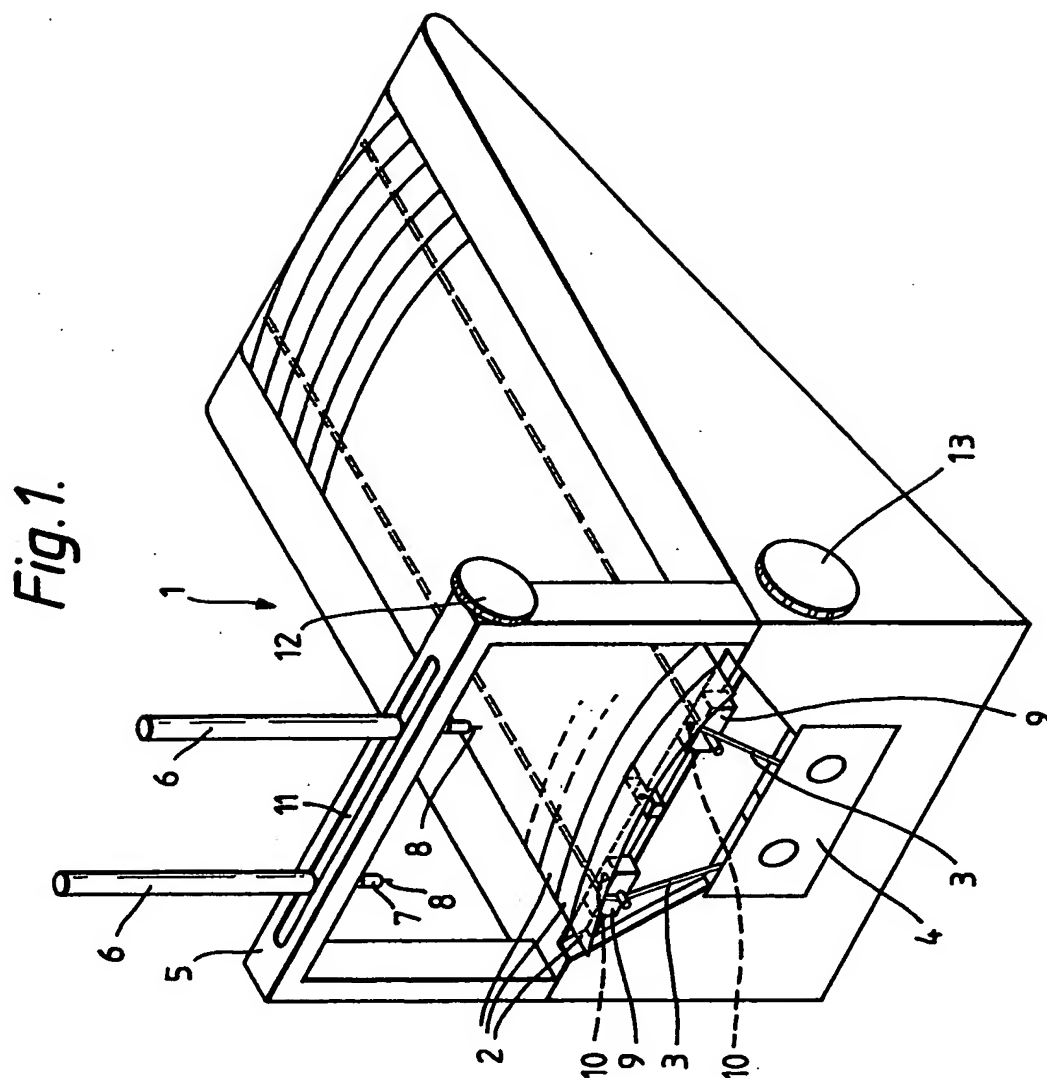
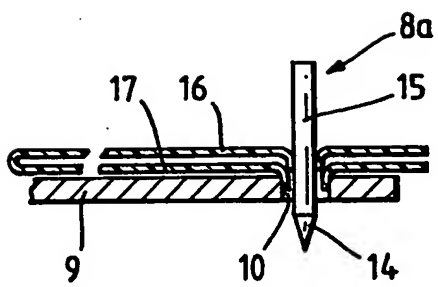
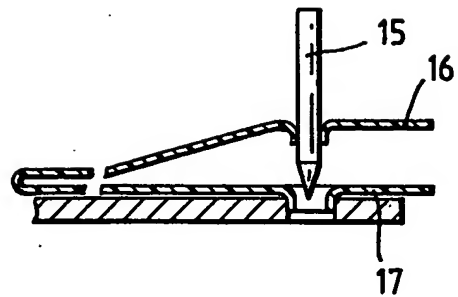
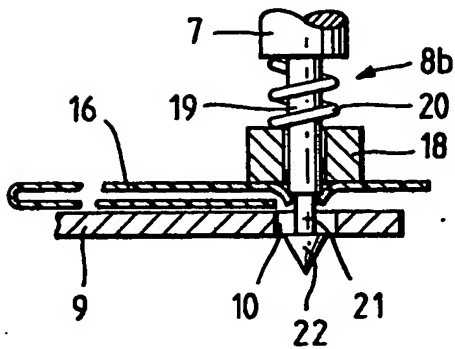
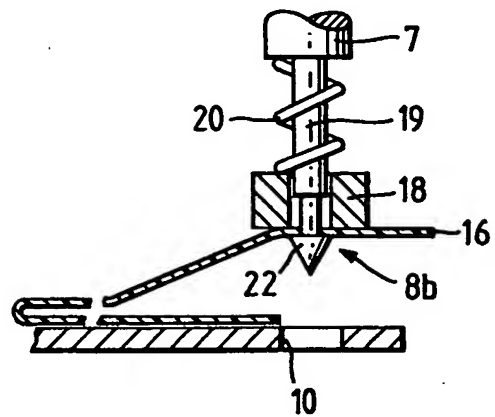


Fig.2.*Fig.3.**Fig.4.**Fig.5.*

SPECIFICATION

Bag opening device for packaging

5 The present invention relates to apparatus for opening plastics packaging bags.

Hitherto, plastics packaging bags have been presented to a packaging location either by advancing them using carrier tapes pulled along a loading table towards the opening location, or by presenting a stack of the bags on a wicket type holder in which it is always the uppermost bag on the stack which is opened, or by advancing a chain of side-sealed bags (i.e. a chain of bags in which the mouths of the bags face sidewardly of the continuous chain, the sides of the bags are sealed by transverse sealed lines of the chain, and the closed end of each bag is defined by the fold line of the web forming the chain). In each case, there is a need for positive opening of the bag at a loading location before a product can be inserted therein. It may even be desirable for the opened bag then to be conveyed to a loading location from the opening location.

Traditionally the opening operation has been carried out using either (a) an air jet blown across the top of the bag to cause the mouth to open and the bag then to billow up ready for loading, or (b) lifting the uppermost panel of the bag with one or more suction pads, or (c) lifting the bag using an adhesive-coated lifting member engaging the outside of the bag, or (d) mechanically ruffling the bag to form a wrinkle in the upper wall which can then be exploited by the injection of inflating air through the wrinkle.

All of these methods have certain shortcomings as regards ensuring reliable and positive bag opening action. Furthermore, the adhesive-coated lifting members usually require a removable adhesive tape which constitutes a costly consumable item, and the suction pad system has the additional disadvantage of a high power consumption to maintain the suction pads operative for bag opening.

It is an object of the present invention to provide a new bag opening system which does not rely on a vacuum effect, and which is more positive than a pneumatic opening system or known mechanical opening system.

Accordingly, the present invention provides apparatus for opening packaging bags, comprising means for supporting a packaging bag in a flat configuration, a penetrating member driven for movement towards and through the flat held bag to penetrate at least one wall of the bag while the penetrating member is moving in a first direction; means for reversing the movement of the penetrating member after penetration of the bag material; and means for holding down that one of said panels on the side of the bag remote from the position of the penetrating member towards which it retracts during its reversed of movement.

In order that the present invention may more readily be understood the following description is given, merely by way of example, with reference to several embodiments of the invention, illustrated in the accompanying drawings in which:-

Figure 1 is a perspective view of a bag opening

table showing a chain of taped imbricated bags on the table ready for opening;

Figure 2 is a vertical section of the tip of a bag opening pin and the anvil table with which it cooperates;

Figure 3 shows the pin and table of Figure 2 during the pin retraction phase;

Figure 4 shows a view, similar to Figure 2, but representing an alternative form of bag opening pin suitable for lipped bags; and

Figure 5 is a view similar to Figure 3, but showing the pin of Figure 4.

Referring now to Figure 1, there can be seen a bag opening table generally designated 1, having thereon an array of imbricated packaging bags 2 connected to a pair of adhesive tapes 3 which are drawn into a tape pulling unit 4 to index the bags 2, as required. In this particular embodiment, the bags have equal length upper and lower panels. However it is possible for either the upper panel or the lower panel to be longer than the other one in order to provide a bag having an extended lip on one face.

A cross bar 5 of the loading table carries a pair of pneumatic rams 6 which operate to reciprocate a pair of spaced "opening pin" carriers 7, each of which carries a respective opening pin 8. When each ram 6 is operated, the opening pins 6 descend towards anvil blocks 9 overhanging the edge of the opening table, and the pins 8 enter suitably dimensioned holes 10 in the anvil blocks 9.

Figure 1 shows that the holes 10 in the anvil blocks 9 are just on the inboard side of the two tapes 3, and it is preferred that the spacing between the tapes 3 and the holes 9 be very small, for example of the order of 5 to 10mm.

It will of course be appreciated that in the embodiment shown in Figure 1 the adhesion of the carrier tapes 3 to the mouth end of the leading bag 2 (the bag having its mouth portion placed on the anvil blocks 9) will hold down the lower panel of the bag, leaving the upper panel free to be lifted away from it to the open the bag. The lifting action is derived by virtue of the fact that as the pins 8 are retracted from the holes 10, there must be some grip of the material of the upper bag panel on the pins 8 to effect the opening action. The design of the pins to achieve this will be described below.

The cross bar 5 includes a longitudinal slot 11 to allow the two rams 6 to be adjusted towards and away from one another by virtue of an adjustment wheel 12 which can be rotated in one direction to close the rams 6 together, and in the opposite direction to move them apart, for example by means of a lead screw mechanism. The wheel 12 is also linked to a similar mechanism which effects movement together and apart of the two anvil blocks 9.

The adjustment wheel 13 can be operated to vary the height of the cross bar 5 in its raised position, for the purposes of adjusting the height of the bag mouth opening in the opened condition.

A suitable optical sensor may serve to stop the indexing action when the bag 2 reaches the desired position on the anvil block 9, and to extend the rams 6 at that time to begin the opening operation. Once the

pins have reached the bottom of their stroke, they automatically retract to lift the top bag panel while the lower bag panel is held in place by the adhesion to the tapes 3.

- 5 Alternatively, the retention of the lower bag panel in place may be achieved by a hold-down finger arrangement where the lower panel of the bag is longer than the upper one to provide a
 10 "lower-lipped" bag configuration. Another possibility is for a suction pad to be built in to the bag support table to hold the lower panel down.

Figure 2 shows a plain pin 8a having a sharpened tip 14 and a roughened shank 15 to increase friction of the shank with the upper bag panel 16. As shown, the
 15 hole 10 in the upper wall of the anvil block 9 is larger in cross-section than the pin 15, with the result that both the top bag panel 16 and the lower bag panel 17 can enter the hole 10 as the pin descends.

- When the pin lifts, the material of the top bag 16
 20 adheres to the surface of the pin shank 15, but slips relative to the material of the lower panel 16, with the result that the upper panel lifts with the pins to initiate the opening action, as shown in Figure 3. As the pin retracts from this large hole 10, it has a better grip on
 25 the top panel 16 than on the lower bag panel 17. It is therefore well able to open an unlipped bag (i.e. one having the upper and lower panels 16 and 17 co-extensive) as illustrated in Figures 2 and 3.

The lower panel 16 is of course held down by the
 30 adhesion to the tape 3 (not shown in Figures 2 and 3) but may be held down by any alternative system, well known in the art, for example suction as indicated above.

- The roughening of the shank 15 of the pin 8a may,
 35 for example, be achieved by threading the shank, or by knurling the shank. Another possibility for increasing the grip of the pin 8a on the upper bag panel 16 is to provide a bulbous end to the pin, just above the maximum diameter part of the conical tip
 40 14. Thus whereas the bag can readily be penetrated by the sharp tip 14 and then adopts a downwardly extending "sleeve" configuration around the pin, the lifting of the pin 8a uses this "downwardly extending sleeve" configuration to lift the top bag panel 16 with
 45 it and the lifting is enhanced by virtue of this bulbous formation (not shown) just above the tip 14.

Figure 4, shows a two part pin 8b intended for bags having an extended upper lip. This pin comprises a collar 18 freely slidable about a plain shank 19 of the
 50 pin and resiliently connected to the pin carrier 7 by means of a helical spring 20.

The pin has, at the bottom of the shank 19, an external annular channel 21 bounded at one side by the shank 19 and at the other side by a conical tip
 55 portion 22 of the pin terminating at the pin point.

As the pin descends, the conical tip 22 penetrates the upper bag panel 16 and enters the hole 10 in the upper wall of the anvil block 9. As this time the material of the upper panel 16 immediately
 60 surrounding the hole formed in it by penetration of the tip 22 forms a downwardly extending sleeve structure extending into the channel 21 of the pin.

As the tip 22 penetrates the upper bag panel 16, the spring-biased collar 18 presses yieldably down
 65 against the top panel 16. During further descent of the

pin carrier 7, the tip 22 and the channel 21 achieve the Figure 4 configuration, while the collar 18 retains its position of pressing yieldably down on to the top panel 16.

- 70 As the pin carrier 7 rises, the shank 19 and the tip 22 begin to retract, as shown in Figure 5, while the collar 18 remains in contact with the top panel 16. During further ascent of the pin 8b towards the Figure 5 configuration, the resilience of the spring 20 holds the
 75 collar 18 down in a position where the peripheral part of the upper panel 16 around the hole penetrated by the pin 8b becomes clamped between the back of the conical tip 22 (i.e. the lower wall of the channel 21) and the lower face of the collar 18, thereby positively
 80 clamping the upper bag panel 16 in position and causing it to be lifted upon further ascent of the pin carrier 7.

Once the pin 8, 8a or 8b has reached its top position, pneumatic bag inflation will have taken over as the
 85 mechanism lifting the top bag panel 16, and subsequently the top bag panel 16 is separated from the pin. Separation may be achieved by the action of ripping the bag 2 off the pins 3 as the product is inserted, or by any other mechanism for example
 90 retracting the pin into the collar to shed the bag panel 16. Any unsightly holes in the top bag panel 16 resulting from separation will be in the bag region adjacent the mouth and consequently will be stripped from the bag during a subsequent trimming
 95 operation as is conventional in the art of bagging.

Separation by retracting the pins 8b into the collars 18 has the advantage that the separation can be accurately timed in the bag opening cycle.

- Alternatively, the bag need not be opened by
 100 inflation as the pins rise. For example, the opened bag may be transferred mechanically, possibly still carried on the pins 8, 8a, 8b, to a bag loading location from the bag opening location. Alternatively the bag opener may be used to open the bags, simply for
 105 unsticking the bags which may then be allowed to reclose.

During tests carried out with pins of the type shown in Figure 1, it was found that the bag opening action was not dependent upon variations in the bag
 110 condition, such as oxidation drying, the presence of moisture, or the presence of surface wrinkles.

As a further test of the apparatus in accordance with the present invention, the embodiment of pins shown in Figures 2 and 3 and in Figures 4 and 5 were
 115 used with several different types of bags, with very high success rates. In one test, the interior of the bags was wetted, to cause the lips to adhere together, and in another test the bag lips were closed on to 1 cm square pieces of double-sided adhesive tape close to
 120 the entry point of the pins, in order to simulate lip sticking. In each case, the pins of Figures 2 and 3 and 4 and 5 were able to open the bags reliably.

A further possibility which has been successfully tested on "lipped" bags uses the configuration in
 125 which it is the upper panel 16 which has the lip, and which therefore adheres to the tapes by its inwardly facing surface. The reliability of the opening action of the present invention is such that it may in practice be desirable to mount the bags on the carrier tapes in
 130 this inverted configuration so that each bag has a

known sticking action which has to be overcome on opening. It is from time to time found that with unlipped bags, intended to be adhered to the tapes by one wall panel only, the shifting of the upper (i.e.

- 5 non-adhered) panel relative to the lower panel may result in it sticking to the tape, thus making some bags more difficult to open than others in the same chain.

CLAIMS

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1. Apparatus for opening packaging bags, comprising means for supporting a packaging bag in a flat configuration, a penetrating member driven for movement towards and through the flat held bag to penetrate at least one wall of the bag while the penetrating member is moving in a first direction; means for reversing the movement of the penetrating member after penetration of the bag material; and means for holding down that one of said panels on the side of the bag remote from the position of the penetrating member towards which it retracts during its reversed movement.

2. Apparatus according to claim 1, wherein there are two said penetrating members.

- 25 3. Apparatus according to claim 1 or claim 2, wherein the or each said penetrating member is a pin having a sharp point.

4. Apparatus according to claim 3, wherein said pin has a roughened shank.

- 30 5. Apparatus according to claim 4, wherein said roughened shank is formed by threading the pin shank.

6. Apparatus according to claim 3 or 4, wherein said pin has a maximum diameter portion close to the tip end of the pin, defining the bulbous part of the pin intended to penetrate said at least one panel of a bag supported by the bag supporting means.

7. Apparatus according to any one of claims 3 to 5, wherein said pin has a reduced diameter portion between the tip and the major part of the shank, defining a channel into which bag material may resiliently move.

8. Apparatus according to claim 7, wherein the tip portion of the pin on the side of said reduced diameter portion remote from the said major part of the shank comprises a conical tip portion having the base of the cone of the same diameter as the said remainder of the shank.

9. Apparatus according to claim 7 or claim 8 and including a collar fitting closely around said remainder of the shank, and slidable relative to the shank.

10. Apparatus according to claim 9, and including means yieldably connecting the said collar to the shank for resilient biasing of the collar towards the tip end of said pin.

11. Apparatus according to any one of the preceding claims, and including means for adjusting the line of action of the or each penetrating member.

12. Apparatus according to any one of the preceding claims, wherein said bag supporting means comprises a bag supporting surface having an anvil surface for penetration by said penetrating member after penetration of the bag to be opened.

13. Apparatus according to claim 12 when

appendent to claim 11, and including means for adjusting the position of the or each hole in the anvil to accommodate the change in position of the or each said penetrating member.

14. Apparatus according to any one of the preceding claims, and including means for carrying the opened bag away from said bag support means for transport to a bag loading location.

15. Bag opening apparatus constructed and adapted to operate substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

- Amendments to the claims have been filed, and have the following effect:-

(a) Claims 1 to 3 and 11 to 13 above have been deleted or textually amended.

- (b) New or textually amended claims have been filed as follows:-

1. Apparatus for opening packaging bags, comprising means for supporting a packaging bag in a flat configuration, a piercing member driven for movement towards and through the flat held bag to penetrate at least one wall of the bag while the piercing member is moving in a first direction; means for reversing the movement of the piercing member after penetration of the bag material; and means for holding down that one of said panels on the side of the bag remote from the position of the piercing member towards which it retracts during its reversed movement.

2. Apparatus according to claim 1, wherein there are two said piercing members.

3. Apparatus according to claim 1 or claim 2, wherein the or each said piercing member is a pin having a sharp point.

11. Apparatus according to any one of the preceding claims, and including means for adjusting the line of action of the or each piercing member.

12. Apparatus according to any one of the preceding claims, wherein said bag supporting means comprises a bag supporting surface having an anvil surface for penetration by said piercing member after penetration of the bag to be opened.

13. Apparatus according to claim 12 when appendent to claim 11, and including means for adjusting the position of the or each hole in the anvil to accommodate the change in position of the or each said piercing member.